AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough; and 2. added matter is shown by underlining.

1.   (Currently Amended) A computerized machine control (CMC) monitoring system, wherein said CMC utilizes a control program to control the operation of a machine through the use of a plurality of digital channels ~~wherein said plurality of digital channels have been pre-defined to comprise a virtual machine~~, said monitoring system comprising:

a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires transition data about <u>a subset of</u> said plurality of digital channels<u>, wherein said subset of said plurality of digital channels includes at least one of said plurality of digital that has been designated to be ignored</u>; and

a data storage component, wherein said data storage component is in communication with said data acquisition component, wherein said data storage component stores the acquired transition data to establish an historical pattern of transition data that is comparable to current transition data independent of the control program, and wherein upon comparison of said current transition data to said historical pattern of transition data<u>, excepting the comparison of those digital channels have have</u>

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been designated to be ignored a determination of the operational status of said ~~virtual~~

machine can be made.

2.   (Previously Presented) The monitoring system of claim 1, wherein said transition data

comprises time-based data that is measured from a pre-defined start.

3.   (Previously Presented) The monitoring system of claim 1, wherein said historical pattern

of transition data is established according to a pre-selected reference data set.

4.   (Previously Presented) The monitoring system of claim 1, wherein said historical pattern

of transition data is established according to one of a plurality of pre-selected reference data sets.

5.   (Previously Presented) The monitoring system of claim 3, wherein said pre-selected

reference data set is selected from a group consisting of: a dynamic pre-selected reference data

set or a static pre-selected reference data set.

6.   (Previously Presented) The monitoring system of claim 3, wherein at least a portion of

said transition data is repeatably cyclic and wherein said pre-selected reference data set

comprises at least one cycle of the repeatably cyclic transition data.

7.   (Previously Presented) The monitoring system of claim 1, wherein said monitoring

system is operable simultaneously with a plurality of CMCs.

8.   (Previously Presented) The monitoring system of claim 7, wherein said plurality of CMCs are selected from a group consisting of: a plurality of CMCs utilizing a single communication scheme and a plurality of CMCs wherein a first CMC utilizes a first communication scheme and a second utilizes a second communication scheme distinct from said first communication scheme.

9.   (Previously Presented) The monitoring system of claim 1, further comprising a viewing component in communication with said data storage component.

10.   (Previously Presented) The monitoring system of claim 1, wherein said monitoring system is remotely monitorable.

11.   (Canceled)

12.   (Currently Amended) A computerized machine control (CMC) analysis system, wherein said CMC utilizes a control program to control the operation of a machine through the use of a plurality of digital channels, said system comprising:

        a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires transition data about a subset of said plurality of digital channels, wherein said subset of said plurality of digital channels includes at least one of said plurality of digital channels that has been designated to be ignored; and

an analysis component, wherein aid analysis component is in communication with said data acquisition component, wherein said analysis component performs analysis on the acquired transition data, excepting those digital channels that have been designated to be ignored, to determine if the machine has experienced a downtime event, and wherein said analysis component develops an inventory of which of said plurality of digital channels likely caused said downtime event independent of said control program, wherein the performed analysis is at least a two step analysis including a probability percentage analysis calculated from a pre-selected historical reference data set and a time sequence analysis.

13.-14. (Canceled)

15.   (Original)   The system of claim 12, wherein said inventory comprises a prioritized inventory of said plurality of digital channels.

16.-17. (Canceled)

18.   (Previously Presented) The system of claim 15, wherein said prioritized inventory is established according to a time proximity to the occurrence of said downtime event.

19.   (Canceled)

20.   (Original) The system of claim 12, further comprising a viewing component, wherein said viewing component is capable of displaying said inventory.

21.   (Original) The system of claim 12, wherein said analysis component performs analysis on the acquired transition data to determine if the machine has experienced a downtime event automatically and absent user-input.

22.   (Original) The system of claim 12, wherein said downtime event is characterized by an event selected from a group consisting of: a statistically significant deviation in at least one of said plurality of digital channels in combination with an expired downtime timer, and an absence of a cycle end transition.

23.   (Currently Amended) A computerized machine control (CMC) analysis system, wherein said CMC utilizes a control program to control the operation of a machine through the use of a plurality of digital channels, said system comprising:

   a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires transition data about a subset of said plurality of digital channels, wherein said subset of said plurality of digital channels includes at least one of said plurality of digital channels that has been designated to be ignored; and

   an analysis component, wherein said analysis component is in communication with said data acquisition component, wherein said analysis component performs

statistical analysis on the acquired transition data, excepting those digital channels that have been designated to be ignored, to determine if one of said plurality of digital channels has experienced an event, as measured from a pre-defined cycle start, selected from a group consisting of: an unexpected transition absent a downtime event and a lack of an expected transition absent a downtime event, wherein said unexpected transition and said lack of said expected transition are characterized by a statistically significant deviation and wherein said analysis component makes the determination independent of said control program.

24. (Canceled)

25. (Previously Presented) The system of claim 23, wherein said statistical analysis comprises standard deviation analysis.

26. (Original) The system of claim 23, further comprising a viewing component in communication with analysis component and wherein said viewing component displays the determination of said unexpected transition.

27. (Canceled)

28. (Original) The system of claim 23, wherein said analysis component stores said determination of said unexpected transition.

29.   (Previously Presented) A computerized machine control (CMC) monitoring system, wherein said CMC controls the operation of a plurality of digital channels under the direction of a control program, said system comprising:

a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires transition data about said plurality of digital channels;

a data storage component, wherein said data storage component is in communication with said data acquisition component, wherein said data storage component stores the acquired transition data to establish an historical pattern of transition data that is comparable to current transition data independent of the control program; and

a viewing component, wherein said viewing component is in communication with said data storage component, and wherein said viewing component displays a sequence diagram of said historical pattern of transition data defined by a first average transition time to on, a second average transition time to off, and a duration time of said individual channel for substantially all of said plurality of digital channels on an individual basis and a sequence diagram of said current transition data.

30.-31. (Canceled)

32.   (Previously Presented) The system of claim 29, wherein said historical pattern of transition data of the individual channel in said sequence diagram display is further defined by a

statistical window about each of said first average transition time and said second average transition time.

33.   (Previously Presented) The system of claim 29, wherein said first average transition time and said second transition time are calculated from a pre-selected reference data set.

34.   (Original) The system of claim 29, wherein said sequence diagram of said current transition data and said sequence diagram of said historical pattern of transition data overlay each other.

35.   (Original) The system of claim 29, wherein said sequence diagram includes a substantially real-time scrolling cursor.

36.   (Original) The system of claim 35, wherein said substantially real-time scrolling cursor stops scrolling at the instant of a downtime event.

37.   (Original) The system of claim 29, wherein said sequence diagram of said current transition data is capable of displaying intermittent failures in said plurality of digital channels.

38.   (Original) The system of claim 29, wherein said viewing component displays a digital channel identifier proximate said sequence diagram, wherein said digital identifier is selected from a group consisting of: an imported name, a user entered name, and an address.

39. (Original) The system of claim 29, wherein said sequence diagram provides analog channel data.

40. (Currently Amended) A computerized machine control (CMC) monitoring system, wherein said CMC controls the operation of a plurality of digital channels under the direction of a control program, said system comprising:

a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires a sub-set of transition data about said plurality of digital channels wherein said subset of transition data includes transition data about at least one of said plurality of digital channels that has been designated to be ignored;

a data storage component, wherein said data storage component is in communication with said data acquisition component, wherein said data storage component stores the acquired transition data to establish an expected historical pattern of said sub-set of transition data that is comparable to a current corresponding sub-set of transition data independent of the control program, wherein both said expected historical pattern and said current corresponding subset exclude from comparison the transition data about the at least one of said plurality of digital channels that has been designated to be ignored; and

a viewing component, wherein said viewing component is in communication with said data storage component, and wherein said viewing component displays the results of

the comparison of said expected historical pattern of said sub-set of transition data to said current sub-set of transition data.

41. (Original) The system of claim 40, wherein said results of the comparison is an indication of whether said current sub-set of transition data matches said expected historical pattern of said sub-set of transition data.

42. (Original) The system of claim 40, wherein said expected historical pattern of said sub-set of transition data is determined from a pre-selected reference data set.

43. (Original) The system of claim 42, wherein said sub-set of transition data is repeatably cyclic and wherein said pre-selected reference data set comprises at least one cycle of the cyclic transition data.

44. (Previously Presented) The system of claim 42, wherein said pre-selected reference data set comprises said plurality of digital channels which have been previously selected to define a virtual machine.

45. (Original) The system of claim 42, wherein pre-selected reference data set is selected by a machine manufacturer.

46.   (Original) The system of claim 40, wherein said sub-set of transition data is selected from a group consisting of: a start-up sub-set of transition data, a shut-down subset of transition data, and a user-defined subset of transition data that is distinct from said start-up sub-set and said shut-down sub-set of transition data.

47.   (Original) The system of claim 40, wherein said sub-set of transition data is comprised of transitions caused by an event selected from a group consisting of: control program induced events and operator induced events.

48.   (Currently Amended) A computerized machine control (CMC) monitoring system, wherein said CMC utilizes a control program to control the operation of a machine through the use of a plurality of digital channels ~~wherein said plurality of digital channels have been pre-defined to comprise a virtual machine~~, said monitoring system comprising:

a data acquisition component, wherein said data acquisition component is in communication with said CMC, and wherein said data acquisition component acquires transition data about <u>a subset of</u> said plurality of digital channels<u> wherein said subset of said plurality of digital channels includes at least one of said plurality of digital channels that has been designated to be ignored</u>;

a data storage component, wherein said data storage component is in communication with said data acquisition component, wherein said data storage component stores the acquired transition data to establish an historical pattern of transition data that is comparable to current transition data independent of the control

program, and wherein upon comparison of said current transition data to said historical pattern of transition data, excepting the comparison of those digital channels that have been designated to be ignored, a determination of the operational status of said virtual machine can be made; and

a viewing component, wherein said viewing component is in communication with said data storage component, and wherein said viewing component displays the operational status of said virtual machine.

49-50. (Canceled)

51. (Previously Presented) The monitoring system of claim 48, wherein said plurality of virtual machines performs different functions.

52. (Previously Presented) The monitoring system of claim 48, wherein the operational status of said virtual machine is displayed in the form of a stack-light.

53. (Previously Presented) The monitoring system of claim 52, wherein said stack-light is color coded to indicate different operational statuses.

54. (Previously Presented) The monitoring system of claim 48, wherein at least one of said plurality of virtual machines utilizes a communication scheme distinct from another of said plurality of virtual machines.

55.   (Previously Presented)   The monitoring system of claim 48, wherein said viewing component displays a time indicator.

56.   (Previously Presented) The monitoring system of claim 55, wherein said time indicator indicates time selected from a group consisting of: machine running time and machine down time.

57.   (Previously Presented)   The monitoring system of claim 48, wherein said viewing component display a cycle count.